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Farm & Home SCIENCE

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Vol. 20, No. 3

September 1959

UTAH STATE UNIVERSITY • LOGAN • AGRICULTURAL EXPERIMENT STATION



Utah Increases Interstate Shipments of Milk

Growing importance of dairying requires expanding market outlets

RONDO A. CHRISTENSEN

milk they processed and packaged. Bulk milk shipped directly out-of-state by Utah producers in 1957 amounted to 4 percent of Utah's production of market milk. About the same amount of bulk milk was received by Utah dairies from out-of-state producers.

Out-of-state sales of market milk increase

Out-of-state sales of market milk increased from 25,303,000 pounds of milk equivalent in 1952 to 41,837,000 pounds in 1957 (table 1). Out-of-state shipments of both bulk and packaged fluid milk increased during this period. Sales of packaged milk increased slightly more rapidly than bulk milk, accounting for 54 percent of all out-of-state shipments in 1952 and 60 percent in 1957.

Central dairies in Utah have gradually increased their sales radius for fluid milk first by developing new markets in outlying cities and towns in Utah which were previously served only by local dairies, and later by expanding further into the nearer parts of all contiguous states. The sales radius for Utah milk was increased even further recently when it was placed on the Denver market. Penetration into the more distant parts of surrounding states will likely continue as the drive to

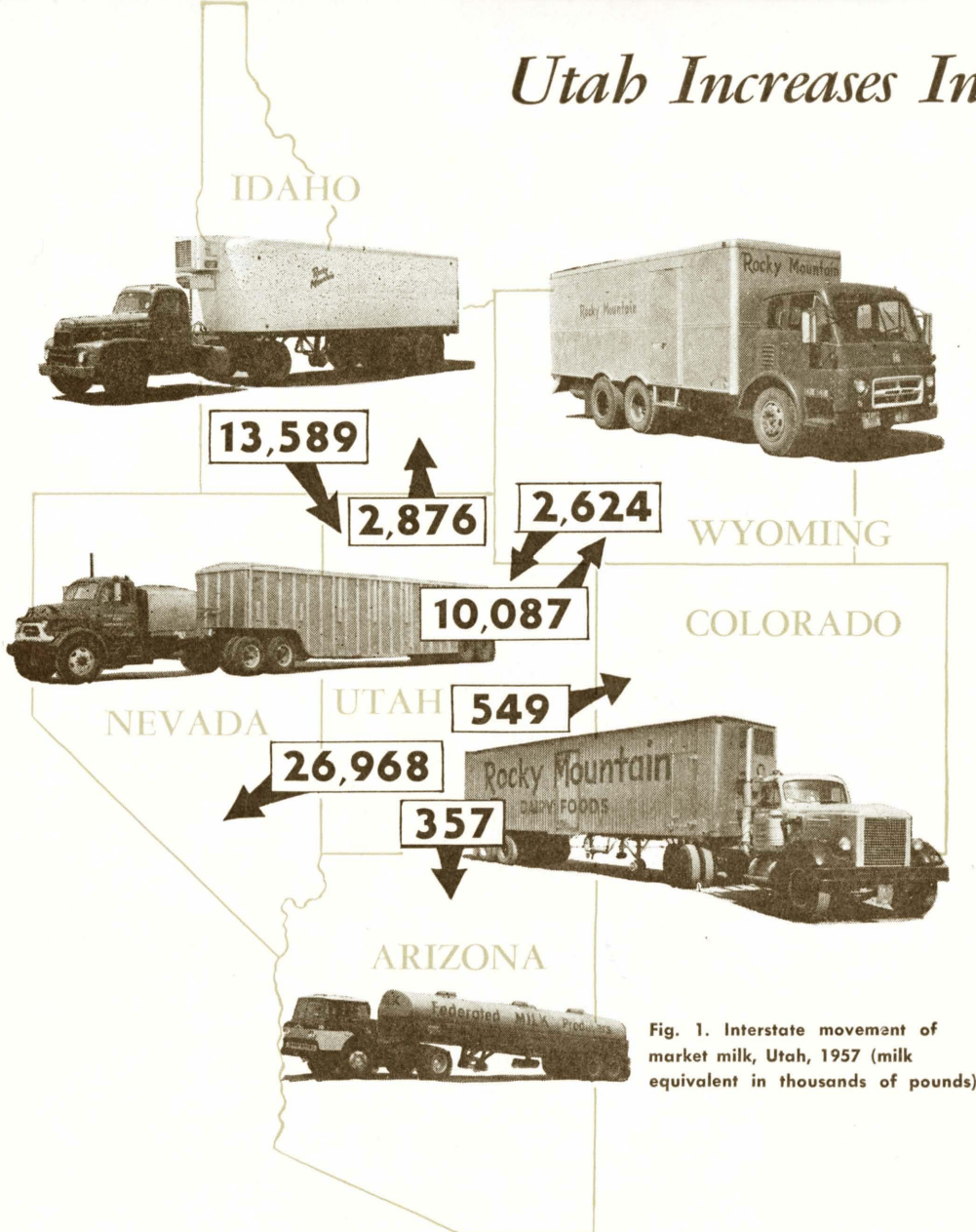


Fig. 1. Interstate movement of market milk, Utah, 1957 (milk equivalent in thousands of pounds)

MOVEMENT of market milk across Utah's borders has increased substantially in recent years as centrally located dairies in Utah have expanded their assembly and distribution areas and increased their size of operation. Some dairies now assemble milk from areas as distant as 250-300 miles from their plant and distribute fluid milk products as far away as 500 miles. The increase in size of central dairies is illustrated by the fact that the largest

four dairies in the state distribute about 60 percent of all fluid milk and the largest 10 distribute 85 percent. This information was gained from a recent survey of Utah dairies. There are about 50 in the state.

Interstate shipments of milk have increased also as southern Utah producers have increased their shipments to Nevada dairies and as Idaho and Wyoming producers have increased their shipments to Utah.

Neighboring states are an important part of Utah's sources of milk and market for milk and will probably become increasingly more so in the future. In 1957, Utah dairies sold out-of-state 10 percent of the

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expand markets continues. Eventually a point will be reached, however, beyond which increased transportation and selling costs will exceed the difference between the value of milk sold for fluid consumption and milk used for manufacturing dairy products. When this point is reached it will be more profitable to divert additional local supplies of milk into local manufacturing rather than sell it as fluid in new more distant markets.

Nevada and Wyoming, two deficit milk producing states, make up Utah's most important out-of-state market (figures 1 and 2). All of the bulk milk sold out of state in both 1952 and 1957 went to these two states. The amount sold increased 44 percent during this five-year period, from 11,654,000 to 16,798,000 pounds. Most of the bulk milk sold

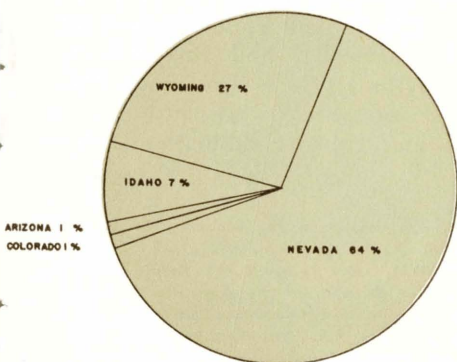


Fig. 2. Distribution of out-of-state shipments of market milk, Utah, 1957

in Nevada was shipped direct by southern Utah producers.

Nevada and Wyoming have not only been Utah's most important out-of-state market for bulk milk, but also for packaged milk. Out-of-state sales of all packaged milk increased from 13,649,000 pounds in 1952 to 25,039,000 pounds in 1957, an increase of 83 percent. The increase resulted mainly from larger shipments to Nevada and Wyoming and partly to shipments to new markets in Arizona, Colorado, and Idaho. Utah's market in some of these states is increasing rapidly. For instance, in 1959 more than 10 million pounds of milk will be sold in Colorado compared with about one-half million pounds in 1957.

Table 1. Out-of-states sales and receipts of market milk, Utah, 1952 and 1957

State	Bulk		Packaged		Total	
	1952	1957	1952	1957	1952	1957
Sales to:						
milk equivalent, thousands of pounds						
Arizona				357		357
Colorado				549		549
Nevada				2,876		2,876
Idaho	10,254	16,798	3,000	10,170	13,254	26,968
Wyoming	1,400		10,649	11,087	12,049	11,087
Total	11,654	16,798	13,649	25,039	25,303	41,837
Receipts from:						
Idaho	2,000	13,589			2,000	13,589
Wyoming		2,624				2,624
Total	2,000	16,213			2,000	16,213
Sales less receipts	+ 9,654	+ 585	+ 13,649	+ 25,039	+ 23,303	+ 25,624

Receipts from out-of-state also increase

Receipts of market milk from out-of-state have increased also. About 2,000,000 pounds of milk were received by Utah dairies in 1952 compared with 16,213,000 pounds in 1957, an increase of more than 700 percent.

Idaho, a surplus milk producing state, is Utah's main source of out-of-state milk. All of the 2,000,000 pounds received from out-of-state in 1952 came from Idaho. By 1957 receipts from Idaho had increased to 13,589,000 pounds and 2,624,000 pounds were also received from southwestern Wyoming.

All milk received from out-of-state in both years was in bulk form and was received by dairies from producers. No milk was packaged out-of-state and sold in Utah. A small amount of packaged milk, however, is now coming into the state. Some from Nevada is sold in southern Utah and some from Colorado is sold in eastern Utah.

Out-of-state sales exceed receipts

Utah stands in a favorable position with respect to interstate shipments of milk. Out-of-state sales exceeded receipts in both 1952 and 1957. Net sales, sales minus receipts, amounted to 23,303,000 pounds in 1952 and 25,624,000 pounds in 1957. These figures show that Utah milk producers have a substantial market for their milk in surrounding states even after deducting the amount of milk

received from other states from the amount shipped them.

Although out-of-state sales of milk increased 16,534,000 pounds between 1952 and 1957, they were largely offset by increased out-of-state receipts of 14,213,000 pounds. Thus net out-of-state sales increased less than two million pounds and remained relatively unchanged during this period.

Utah dairies and producers sold substantially more bulk milk in surrounding states than they received from them in 1952. Receipts of bulk milk from nearby states, however, have been increasing more rapidly than out-of-state sales. As a result, about as much bulk milk was received from surrounding states as was sold them in 1957.

The fact that no fluid milk packaged out-of-state was sold in Utah during 1957 while a substantial amount was packaged in Utah and sold out-of-state emphasizes three points. First, Utah is relatively isolated from outside surplus supplies of packaged grade A milk. Second, Utah's dairy industry has the capacity more than to meet local demand. And, third, Utah dairies compete successfully with local dairies in out-of-state markets.

Utah dairies will continue their efforts to expand out-of-state sales for some time since production of milk is still increasing faster than population in Utah, and since about one-third of Utah's market milk is currently being diverted to manufacturing for lack of a fluid-milk market.

Clearing and fencing land and drilling wells costly

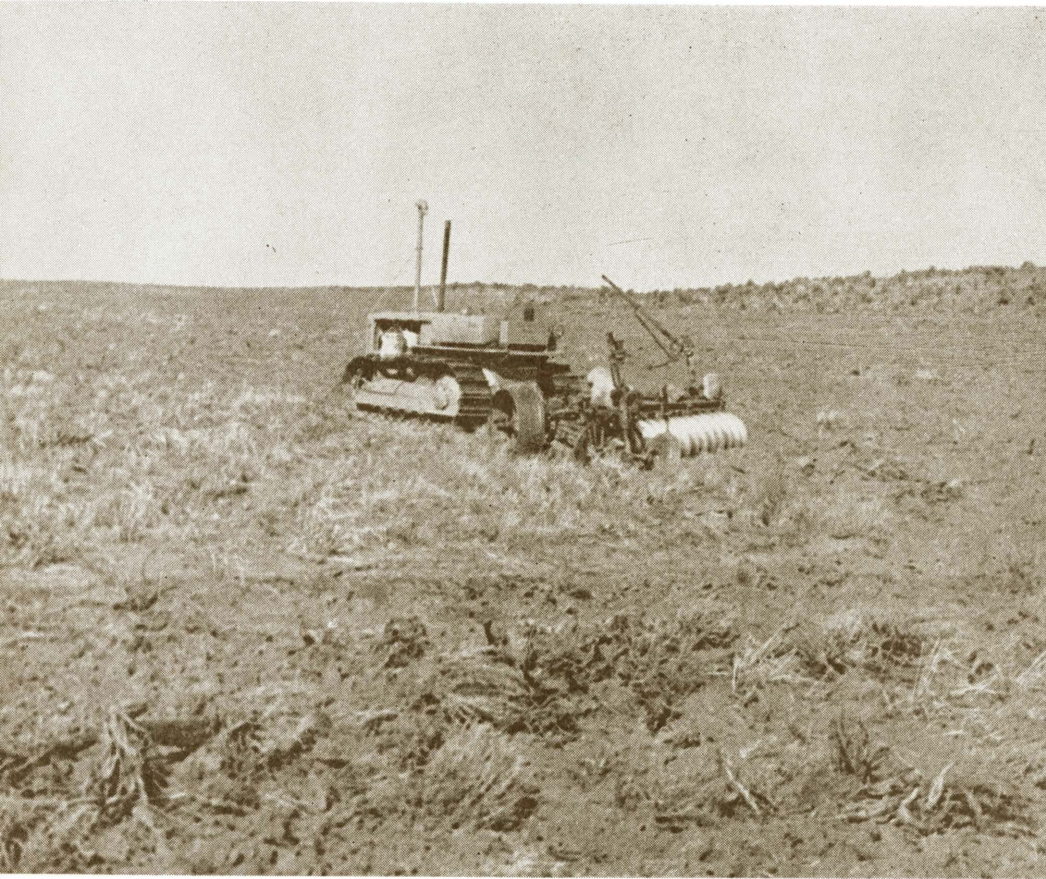
Problems in Acquiring a Farm Under the Desert Land Act

CLYDE E. STEWART

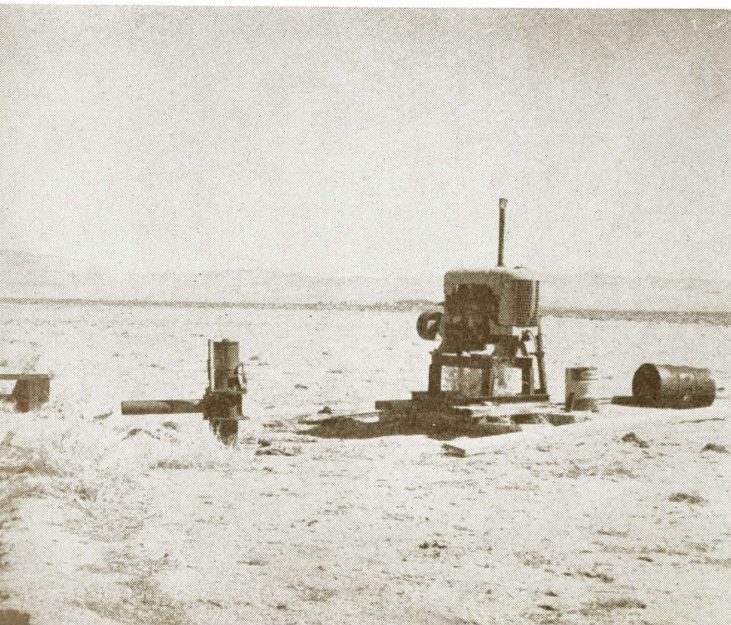
A COMBINATION of capital and physical limitations has substantially deterred the development of desert-land tracts in Utah. The cost of a water supply is the greatest obstacle to most applicants for land under the Desert Land Act.

This is the conclusion drawn from a detailed study of applications in five areas of Utah: Grouse Creek, River Bed, Skull Valley, Pavant Valley (Flowell), and Snake Valley (Garrison). Forty-three individuals were interviewed. Because of family and other combinations, those

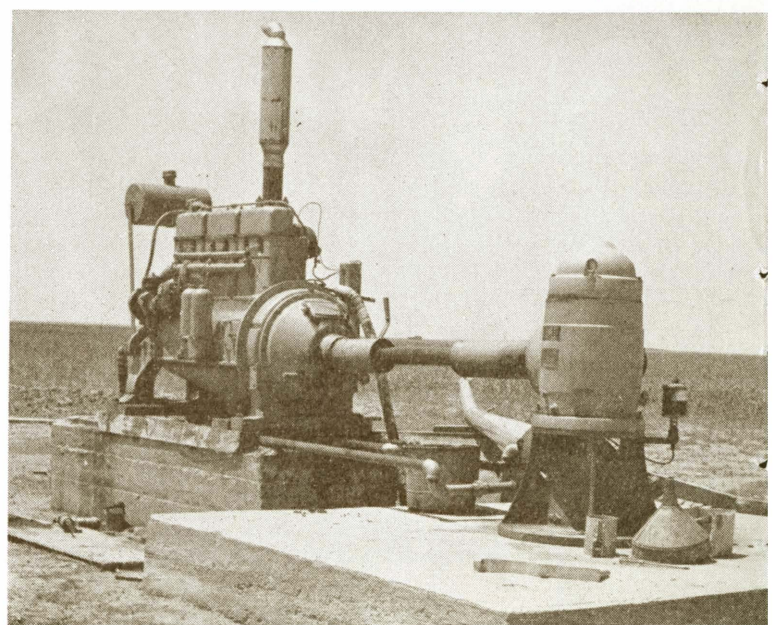
In an article in the March 1959 issue of FARM AND HOME SCIENCE, DR. CLYDE E. STEWART, who is with the Farm Economics Research Division of the Agricultural Research Service, discussed the renewed activity under the Desert Land Act. With this renewed activity, many individual and public administrative problems arose. Recognizing the probable need for legislative and administrative changes for the revised programs, the U. S. Bureau of Land Management requested the Farm Economics Research Division to study these problems. This article reports results of research conducted in Utah in cooperation with the Utah Agricultural Experiment Station.



Land clearing requires large equipment



An abandoned desert land entry



Large amounts of capital are required to develop a well and pump

interviewed represented 55 tracts, or about a third of the 170 applications that had been made for land in these areas. Twenty-two applicants had drilled 30 wells; 7 of the 22 applications had been closed after the wells had been drilled.

History of the Desert Land Act

The renewed activity of land and water development under the Desert Land Act during the last 10 years was discussed in an earlier article. The act was passed in 1877 to promote the formation of irrigated family farms by individual capital and initiative.

For many years after 1900, few land entries were made under the act, but since World War II, high incomes and improved pump efficiencies have made it possible to develop ground water in many new areas. Although capital costs are high, the Desert Land Act makes it possible for individuals to develop irrigated farms on public land.

Who can apply for land

There are few restrictions on who can apply. Occupation, experience, and the financial status of the applicant are not considered. The main requirements are that the person be a resident of the state, a citizen, and over 21 years of age.

About a fifth of the applicants interviewed were farmers. The others came from a wide variety of occupations. About two thirds of them

were salaried and wage employees, of whom half were in such professional fields as school teaching, federal employment, surveying, and geology. About a sixth of the total operated small businesses.

Only two applicants lived on desert-land tracts. About a fourth indicated that they intended or wanted to live on the land after it was developed.

Capital needs

Even if the applicants found land with adequate basic physical resources, the large capital needs for ground water development posed serious problems. Many pump wells installed were too small to meet adequate irrigation requirements under the act. The applicant cannot develop his well himself, so he has a heavy initial cash cost. Moreover, high uncertainty and risk accompany the venture. The average cost reported for casing, drilling, pumps, and motors was about \$5,600. The range was from \$3,000 in Grouse Creek and Skull Valley to more than \$10,000 in the River Bed area.

Land development

Land in the areas studied is relatively flat and smooth and vegetation is sparse. Even so, wide variations in costs of development were reported. Clearing brush cost from \$2.50 to \$4.50 per acre. Leveling cost \$10.00 to \$45.00 an acre. About \$15 to \$20 an acre was needed for the

irrigation systems. Several farmers added \$30 to \$40 an acre for lining ditches, making a total cost for the irrigation system of around \$50 an acre. Fencing cost about \$1,500 for a 320 acre tract.

Farm buildings and residences were small where there were any. Reported expenditures for farm buildings were \$500 to \$1,000 per farm. Residences cost from \$3,000 to \$4,000.

Total capital needs

Total capital needed to develop a desert-land tract during the last five years ranged from \$17,000 to \$40,000. The variation depended chiefly on the depth and adequacy of the water supply and the value of the residence. These estimates do not include farm buildings; nor do they include travel and supervisory costs incurred during the developmental period. In addition, there is a wait-

Forage crops are the main crops in desert land areas



Most desert land entries are based on the development of ground water



ing period of several years while the land is getting into production. Returns on investment usually are low during these initial years.

Risk of loss

Great uncertainties characterize desert-land development in Utah. Quantity and quality of ground-water supplies are largely unknown. The potential agriculture is an extensive, low-income type because of location and climate.

About a third of the applicants in the study area who drilled wells met with failure. About a fourth had acquired patent. Many of the others were in an uncertain status.

Losses incurred when water is not found are not excessively large. Compared with wells in many areas, those studied are not deep. A greater uncertainty prevails as to the long-time supply of water. Initial investors are faced with possible depletion by themselves or later applicants. It is probable that these uncertainties have deterred activity under the Desert Land Act.

Extent of land development

The total land in applications in the areas studied was about 49,000 acres, of which about 16,000 acres was included in the study sample. Of the latter, about 8,300 acres were in 28 allowed entries. Nineteen of 28 applicants had irrigated about 2,150 acres. These applicants had more than met the legal requirement of irrigating an eighth of the total area.

Only 30 of the 170 original applicants still had an assured opportunity to acquire patent. Another 30 applications were in the "filed" status.

Among allowed entries in the study, about two thirds of the individuals gave "lack of capital or money" as the main reason for not developing the land more fully. "Lack of time" was an important obstacle for many who had full-time jobs. Difficult soil problems were also given as reasons for delay.

Irrigation water supplies

The 30 pump wells in the area studied were distributed as follows: 4 in Grouse Creek, 4 in Pavant Valley, 4 in River Bed, 14 in Skull Valley, and 4 in Snake Valley. Nine of the 30 wells were in 7 "closed" cases, 2 in Grouse Creek and 5 in Skull Valley. All wells in the other three areas produced "adequate" water supplies.

Well depths

The average pump setting reported was about 75 feet in Skull Valley, 60 feet in Pavant Valley, 85 feet in River Bed, and 55 feet in Snake Valley. The respective static water levels averaged about 25, 40, 55, and 14 feet in the four areas. In Grouse Creek, the static water level averaged about 30 feet. Many variations in depths occurred within and among areas.

Kind and size of wells

Diesel or gas power pumps were used on most wells. The most common size of power unit was 80 horsepower, but about a third of the units were less than 50 and averaged 35 horsepower.

Casings ranged from 6 to 16 inches in diameter. About half of them were 12, 14, or 16 inches. All casings of less than 12 inches were in Skull Valley.

Pump ratings averaged 8.5 cubic feet per second (c.f.s.) in Pavant Valley and 4.0 in River Bed and Snake Valley. Pumps in Grouse Creek and Skull Valley were much smaller.

Operation and use

Twenty-six wells were checked in the study. Of these, 6 were used only for test and 5 were unused. The remaining 15 were used to irrigate from 6 to 400 acres of crops per well.

The four wells in Pavant Valley irrigated about 346 acres per well. In River Bed, 2 wells irrigated an average of 135 acres each. Similar use was made of 2 wells in Snake Valley, 100 acres each. Land irri-

gated from 7 wells in Skull Valley averaged only 40 acres per well.

Adequacy of water supply

Reported water use during the season from wells averaged 3.1 acre feet per acre. The range was from 1.6 acre feet in Snake Valley to 5.2 acre feet in Pavant Valley.

On the basis of rated pump capacities, the wells in the 5 areas could supply 3 acre feet in 100 days to about 200 acres per well. Most wells in Grouse Creek and Skull Valley are rated far below this capacity.

As a guide, a rated pump capacity of around 5 c.f.s. operating continuously for about 100 days would supply 3 acre feet per acre to 320 acres. About half of the wells studied approached or exceeded this standard.

The development process

In most instances, the achievement of patent through irrigation of public land in the areas studied requires the development of underground water. Within 4 years, the entryman must make large expenditures for a pump, a well, and land development.

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The Blackinton Canning Company at Ogden canned the cherry delight.

Three new refreshing fruit drinks—cherry delight, apricot and peach nectars

THREE fruit drinks have recently been investigated by the Utah Station and were found to be feasible for commercial production within the state. The relative abundance and reasonable cost of Montmorency sour cherries, Large Early Montgamet (Chinese or Jones) apricots, and Elberta peaches formed the bases for cherry delight, apricot nectar, and peach nectar. The sour cherries were given a series of treatments of pitting, heating, pressing, filtering, sweetening, and diluting to make the new sour cherry drink. A relatively new method of production involving a minimum time of heating and rapid cooking gave two excellent nectars with no "overcooked" taste.

Trained taste panels have evaluated these three drinks as superior to the one cherry drink found in one

store in Salt Lake City and to the apricot and peach nectars commonly found in grocery stores throughout the state.

In 1956, more than 110 gallons of each drink were prepared and canned in appropriate 12-ounce cans (211x414). This quantity of liquid gave over 1200 cans of each product.

Peach nectar

The peach nectar was prepared as follows: Mature but firm Elberta peaches were picked and allowed to ripen. The fruits were then washed, sorted, halved, pitted, and steamed for 3 minutes at 10 pounds pressure in a canning retort. This heating at 150° F. inactivated surface enzymes in the fruit and loosened the skins. The peach halves were then placed immediately in cold water and the skins removed. After sufficient fruit was accumulated for a batch, it was placed in a steam jacketed kettle with an equal quantity of water and



Numerous tests were made in the laboratory to develop the right consistency for each juice

R. K. GERBER

D. K. SALUNKHE

heated to 160° F. This mixture was passed through a Fitzmill with an 0.040 inch sieve and in an atmosphere of nitrogen. This inert gas was used to minimize the oxidative browning often found in processed fruit or fruit products. The resulting nectar was sweetened with sucrose and acidified with citric acid to give a sugar/acid ratio of 30 to 1 (15 percent sugar, ½ of 1 percent acid). Eight-gallon batches of nectar were heated to 196° F. and canned immediately. After sealing, the cans were plunged into cold water for rapid cooling.

Apricot nectar

Ripe Chinese apricots were washed, sorted, pitted in an Elliot pitter, mixed with an equal volume of water, heated to 160° F. in a steam jacketed kettle, sieved through a 0.040 inch screen in the Fitzmill in

MR. GERBER AND DR. SALUNKHE are both assistant professors of horticulture.

an atmosphere of nitrogen and sweetened to 15 percent sugar with sucrose. The nectar at this stage had $\frac{3}{4}$ of 1 percent of acid. Thus, the sugar/acid ratio was 20 to 1. The nectar was then heated to 196° F. in 8 gallon batches and canned in 12 ounce cans (211x414). After sealing, the cans were immediately plunged into cold water.

Cherry drink

Montmorency sour cherries picked without stems were washed, sorted, pitted in an Elliot pitter, heated in a steam jacketed kettle to 160° F., mixed with 2 percent diatomaceous earth, and pressed in a cider-mill press. The resulting juice was filtered in a Sparkler laboratory filter, diluted with an equal volume of sirup of such strength as to give a final product of 15 percent sugar, $\frac{3}{4}$ of 1 percent acid, and thus a sugar ratio of 20 to 1. This mixture was then heated in 8 gallon batches to 196° F. and filled and sealed in sour cherry enamel 12 ounce cans (211x414). After sealing, the cans were immediately plunged into cold water.

An important factor in the quality of these drinks was the minimum of heat applied. Competing products were often classed as "overcooked." Some swelling of cans caused by spoilage organisms occurred and these were discarded.

Taste evaluation

Samples of these three drinks were served on many occasions at the Utah State University including the annual Agathon celebration, an annual convention of the Extension Service workers, a convention of foods and nutrition research workers, and others. Samples were also served to local civic and religious groups and to Extension Service meetings throughout the state. Several hundreds of people tasted these products.

In each instance, ballots were given to those tasting the drinks and a judgment was rendered concerning the like or dislike for them.

When apricot nectar was tasted alone, 92 percent of the people liked

it. Those who sampled the cherry delight alone returned 94 percent favorable ballots; 92 percent of those who sampled the peach nectar alone liked it.

When a comparison of the three drinks was made, 62 percent favored the cherry delight, 28 percent favored apricot nectar, and 7 percent favored the peach nectar. Three percent did not like any of the juices.

Commercial possibilities

The commercial possibilities of cherry delight were investigated by processing a ton of sour cherries at the Blackinton Canning Company of Ogden, Utah. The sour cherries were first washed, sorted, pitted, and heated to 160° F. in the Food Processing Laboratory of the Experiment Station. Half of this pulp was then pressed and filtered. It was all frozen in 30 pound containers to wait for a favorable time to be processed at the cannery.

The frozen pulp and juice were taken to the cannery, thawed out, and processed separately. Each was diluted with an equal volume of water and sugar was added to give a soluble solids content of 15 percent. The sugar/acid ratio of each was 20 to 1. These mixtures were passed through a pre-heater where the temperature was raised to 170 degrees F. The juice was mixed thoroughly in an assembly tank and then sealed in 46 ounce (404x700) cherry juice cans. After passing through the pre-heater, the pulp mixture was passed through a tomato juice extractor, assembled, mixed, and sealed in the 46 ounce cans. This latter drink was quite cloudy in appearance but the flavor was similar to the clear drink. Both types of juice were cooked for 20 minutes in boiling water. Twenty-eight cases (12 cans per case) of clear drink and 32 cases of cloudy drink were obtained. The smaller quantity of clear drink was caused by leakage in the equipment.

More than 100 samples of this clear cherry delight prepared in cooperation with the Blackinton Canning Company were sweetened slightly and judged by visitors at the

third annual Agriculture-Industry Conference held in January 1959, at the Hotel Utah in Salt Lake City. More than 90 percent indicated that they liked the product. Several asked where it could be obtained commercially. One bought a case for his restaurant in Salt Lake City. The ZCMI Health Bar bought a case. A restaurant manager in Logan bought 5 cases and served the drink at banquets and civic club luncheons. More than three fourths of those drinking it liked it "moderately" to "very much."

Powdered cherry drink

Twenty four number 10 cans of a semi-concentrate were prepared by adding 31 pounds of sugar to 120 pounds of cleared cherry juice with no dilution. These were sent to the Department of Agriculture Western Utilization Research and Development Division at Albany, California where experiments were conducted to determine if a water soluble powder could be prepared from this material. The following formula was finally written of the processes necessary to make the powder: 50.6 pounds of the semi-concentrate (30° Brix) was further concentrated to 22 pounds of 60° Brix. This was mixed with 17.2 pounds of 60° Brix sugar sirup containing 200 grams of citric acid. This final mixture was dried in a vacuum oven and yielded 22 pounds of an hygroscopic powder. This, of course, must be stored with a dessicant. This 22 pounds of cherry powder can be mixed with fifteen gallons of water. The cost of the materials going into this final product is about \$6.10. This would make the material in each gallon cost 41 cents. The drink thus obtained is less red in color but tasted much like the standard cherry delight produced at Utah State University.

Sweeteners

In response to the question, "Does sugar have to be added to the diluted cherry juice to make an acceptable drink?" an investigation was undertaken to determine the value of other sweetening agents. Honey, Su-

(Continued on page 79)

adding zinc sulfate to dormant spray

controls ZINC DEFICIENCY

R. L. SMITH

IT is surprising that zinc deficiency has increased in Utah during the past ten years even though economical preventative measures have been known for some time.

In 1948 6 percent of the orchards in Utah showed zinc deficiency but in 1957 more than 10 percent showed symptoms such as little leaf and small, misshapen fruit,

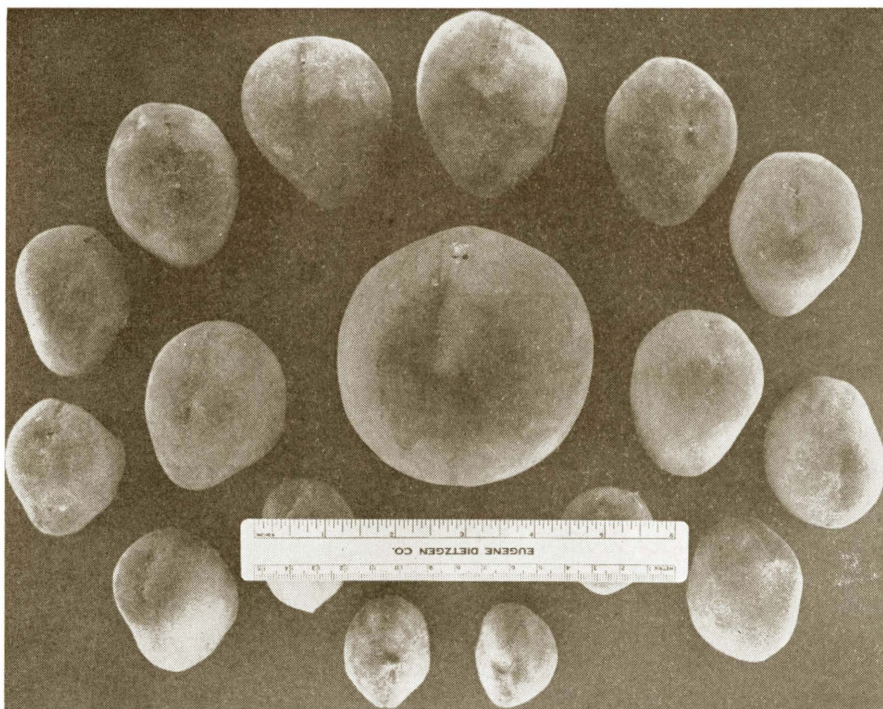
Why do Utah fruit growers con-

tinue to produce small misshapen fruit from zinc deficient trees, when the treatment for zinc deficiency is so simple? A solution of 15 to 30 pounds of zinc sulfate per 100 gallons of water may be combined with bordeaux mixture or lime sulfur as a dormant spray to control zinc deficiency as well as mites, San Jose scale, and mildew.

This concentrated spray cannot be used on the foliage. For leaf sprays, the zinc sulfate is cut to 5 pounds per 100 gallons of water plus 2 to 3 pounds of lime hydrate to prevent leaf burning.

(Continued on page 73)

DR. R. L. SMITH is assistant professor of agronomy. His research deals mostly with factors affecting plant nutrition, especially micronutrient elements and nitrogen in soils.



Tree showing typical symptoms of zinc deficiency. Notice the die-back on upper branches and the rosetting of leaves on the branch on the upper right

Abnormal fruit shapes may be useful symptoms in detecting early stages of zinc deficiency.



Experimental tomato field in 1958. The foreground was planted to wild varieties from South America, the center to standard varieties, and the background to hybrids carrying some resistance to curly top



Healthy plant and plant with curly top. Curly top causes twisting and yellowing of leaves, stunting, and finally death of the plant

Tomato plant with curly top



Dr. John Martin examines a plant in the curly top breeding plot at North Logan



Learning to control curly top in tomatoes

ORSON S. CANNON

TOMATO curly top was so prevalent and resulted in the death of so many plants in 1958 that all Utah tomato growers suffered heavy losses, so heavy that tomato production for the state was less than 20

percent of normal. Cannery and those associated with the canning industry participated in losses along with the growers. They were unable to use their factories profitably, or their equipment and workers, or to supply their markets. Seasonal workers and others lost an important source of income.

Cause of 1958 losses

The cause of curly top disease is a virus which is transmitted to susceptible plants by the sugar beet leafhopper, an insect whose breeding grounds are the deserts of the West. Conditions for the winter survival of leafhoppers were ideal in the winter of 1957-58. Early fall rains caused plants on which leafhoppers live to germinate early and winter conditions were ideal for the survival and multiplication of the hoppers. As

a result, when Station entomologists made their regular survey of the desert breeding grounds in February 1958, they found about 1,500 times as many virus-carrying leafhoppers as they had found in February 1957. In April, May, and June the leafhoppers moved great distances to the greener vegetation of cultivated areas. Tomatoes, which they fed on, contracted the disease, turned yellow, and died.

Fortunately, the number of leafhoppers on the desert breeding grounds in 1959 was much smaller than in 1958, so now there are only a few plants with curly top in most of Utah's tomato fields.

Curly top control

Work on curly top control has been conducted in Utah for many years. The surveys developed by Howard Dorst and conducted by him have made it possible to predict whether much or little curly top will occur in a given year. Work by the late H. L. Blood and Howard Dorst and their co-workers has shown that losses from curly top will be reduced if a larger number of plants are planted per acre. Much work

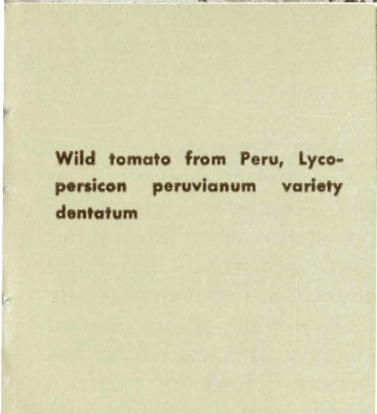
DR. ORSON S. CANNON is head of the Department of Botany and an authority on tomato breeding. He was formerly in charge of tomato breeding work for the U. S. Department of Agriculture on the Logan campus and worked cooperatively with the Utah Station. He developed the Loran Blood and VR Moscow varieties, resistant to verticillium wilt and now grown throughout the tomato canning areas of the state. Dr. John Martin has recently arrived on the campus to take over the tomato breeding research. He is a native of Twin Falls, Idaho, and has just completed his studies for the Ph.D. degree at Cornell University. He took his bachelor's degree at the University of Idaho.



Wild tomato used in the breeding program. *Lycopersicon pimpinellifolium* currant tomato



Lycopersicon glandulosum



Wild tomato from Peru, *Lycopersicon peruvianum* variety *dentatum*



Lycopersicon peruvianum variety *humifusum*



has been done on the development of a curly top resistant tomato, but to date no satisfactory resistant variety has been developed. (The Owyhee variety was released by the Idaho Agricultural Experiment Station for limited trial in 1959. It carries fair curly top resistance. Trials now being conducted will show whether it will be satisfactory in Utah).

In breeding for curly top resistance a number of interesting facts have been discovered:

1. *No resistance to curly top has been found in any commercial variety.*

When the curly top epidemic of 1930 wiped out two-thirds of the tomatoes of Utah, H. L. Blood selected seed from 1400 plants which survived. He also collected tomato seed from all possible sources in the United States and from other countries. These were tested for curly top resistance in Hurricane, Utah, under conditions favoring curly top development. Two examples will illustrate the results he obtained in all of the tests he conducted: Out of 57,879 plants grown in 1932, only 283 survived. This is 0.5 of one per-

cent survival. In 1933 he planted 15,556 plants from seed taken from the survivors of 1932. Only 65 plants, or 0.4 of one percent survived.

2. *There is a limited amount of curly top resistance in some wild tomato species. *Lycopersicon peruvianum* var. *dentatum*, *Lycopersicon peruvianum* var. *humifusum*, and *Lycopersicon glandulosum* have fruit which are yellowish-green and as large as a small marble when ripe. *Lycopersicon pimpinellifolium* has red fruit about the size of a currant. The first three hybridize with regular tomatoes only with difficulty and progeny of such crosses often are sterile. *L. pimpinellifolium* crosses readily with regular tomatoes.*

3. *The curly top resistance of wild tomatoes can be transferred to tomatoes with satisfactory commercial qualities.* The resistance of wild tomatoes has been transferred to tomatoes which produce fruits with good red color and intermediate size. Most of these resistant offspring have some minor undesirable characteristics which can be eliminated with further breeding and selection.

Progress in learning to control curly top has been slow, and measures such as planting more plants per acre to lessen curly top losses in epidemic years, are of limited value only. At present the two most promising possibilities for curly top control appear to be the development of an insecticide that will kill the leafhopper before it can transmit the virus to tomatoes and the development of varieties with good horticultural characteristics and curly top resistance. Work with these two goals as the main objectives is being carried on at the Utah Agricultural Experiment Station. One or both of these goals may be reached before the coming of another curly top epidemic.

NEW PUBLICATION

Bul. 412. Handling milk on grade A farms in Utah, by Earnest M. Morrison and Leon G. Clark. Department of Agricultural Economics. 19 p.

This bulletin reports a study of bulk tank and can handling of milk in Cache and Sanpete Counties and compares the cost of each method.

Alfalfa Stem Nematodes Reduce Hay Yields

DEVERE R. McALLISTER



Above, Washington County Agent J. Keith Hughes and Anson B. Call, former county agent and now extension horticulturist, examine stem nematode resistant Lahontan alfalfa. Susceptible Ranger and Buffalo are also shown

Right, USU scientists J. Clair Theurer, Devere R. McAllister, and M. W. Pedersen examine nematode damaged and healthy alfalfa plants from Ranger and Lahontan plots at St. George

DR. DEVERE R. McALLISTER is professor of agronomy. His research is in the area of forage crops.

As judged by its recent spread, the alfalfa stem nematode (*Ditylenchus dipsaci*) shows every evidence of becoming as destructive to alfalfa stands as the bacterial wilt organism was a few years ago. Before the development and distribution of wilt-resistant varieties of alfalfa, such as Ranger and Buffalo, it was difficult for farmers to maintain good alfalfa stands for more than 4 or 5 years. With the introduction of Ranger and Buffalo, for the past 10 or 15 years farmers have enjoyed satisfactory performance from these wilt-resistant varieties. This period is coming to a close with the rapid spread of the alfalfa stem nematode. Growers, in increasing numbers, in the major irrigated valleys throughout the state, are again experiencing difficulty in maintaining alfalfa stands. This trouble arises from the stem nematode, which affects wilt-resistant varieties as well as others. New alfalfa varieties of the future will need to have resistance to the stem nematode as well as to bacterial wilt.

Alfalfa stem nematodes have reduced hay yields of susceptible varieties in Washington, Salt Lake, and Uintah County varietal trials conducted by the Experiment Station.

Two years after seventeen varieties were planted near St. George only stem-nematode-resistant La-

hontan and Nemastan showed healthy growth. Total hay yields from the eight crops harvested during 1955 and 1956 tell the story:

Nemastan	14.8 tons	B.Y. strain	10.5
Lahontan	14.7	Vernal	10.5
Arizona		919 (Ne-	
Chilean	12.7	vada)	10.1
Talent	12.0	DuPuits	9.4
Ranger	11.9	Grimm	9.4
Caliverde	11.7	Ladak	8.0
Stafford	11.6	Narragansett	7.3
Buffalo	11.4	Nomad	6.1
Atlantic	10.9		

Active stem nematodes were found on all varieties; however, Lahontan and Nemastan, which exhibited good stands when plowed out in 1957, were apparently not damaged. Nemastan is not commercially available. Most of the alfalfa planted in the St. George area since 1956 has been Lahontan which also carries resistance to bacterial wilt, fusarium wilt, and to the spotted alfalfa aphid.

Salt Lake County

Strikingly similar results were obtained at West Jordan where Lahontan and Nemastan led 24 varieties in yield by the end of the second crop year. Five years after seeding, these two varieties maintained productive, weed-free stands whereas all others had been replaced by dandelions and grasses.



Uintah County

Near Vernal Lahontan and Nemastan led forty varieties in yield by the end of the third crop year.

Dr. Oliver F. Smith and Richard N. Peaden of the USDA's Agricultural Research Service, Reno, Nevada, report Ranger alfalfa hay yields reduced 1½ tons per acre per year and stand reductions of 35 percent due to stem nematodes. The resistant variety Lahontan was not affected. Lahontan was developed by Dr. Smith and released in 1954.

Other counties

Lahontan and Nemastan were not the leading varieties in yield in Garfield, Millard, Sanpete, Weber, Juab, and Emery County trials; however, they maintained good stands.

Washington, Salt Lake, and Uintah are not the only counties infested with alfalfa stem nematode. Known infested areas also occur in Utah, Duchesne, Sanpete, Cache, and Box Elder Counties. A complete state survey is necessary to determine more accurately the distribution of this pest.

On the stem-nematode-free experimental farms in Cache Valley, Lahontan is less productive than Ranger. Tests have not been conducted in this area on nematode-infested land. However, on the basis of other tests, Lahontan is the only available variety that can maintain a satisfactory stand for more than two or three years on heavily stem-nematode-infested land.

Readily spread

Alfalfa stem nematodes are carried from field to field by running water, on implement wheels, in hay, and on dirty feet. High moisture and flood irrigation favor the spread of these pests. They are not known to cause damage to dry-farm alfalfa. Nematologists indicate that the infested areas are increasing in size and number. The bulb or stem nematode has a wide host range, but several "races" are recognized within the species, each of which

may attack only a limited number of hosts.

Do you have stem nematodes?

Whenever the spring growth on two to three year old Ranger or Buffalo alfalfa is retarded and uneven in appearance and hay yields are reduced, stem nematodes may be suspected. Above ground stems on some plants may be swollen, have short internodes, and appear overly leafy. Below ground infested buds on the crown become thickened and deformed and usually fail to develop into normal stems. They rot off and a condition similar to crown rot may develop. Such stunted, devitalized plants soon die leaving poor stands.

As the season progresses and temperatures climb, the nematodes become less active and field symptoms are masked by the more rapid growth of the less severely affected plants. When the infested plants are dried for hay the nematodes become dormant, and in this condition are capable of surviving for long periods of time. Large numbers of the infective stage, preadult larvae, may be found in such material, and when conditions are suitable will escape from the decaying plant tissue and invade new hosts. Long, cool, wet falls and springs hasten their activity and damage.

What are nematodes?

Stem nematodes are slender, minute eelworm adults, which are about 1 mm or 1/20 of an inch long. They live as parasites within the tissue of alfalfa plants. They multiply rapidly and young larvae resemble the adults. Identification requires the services of a trained nematologist who examines suspected plant tissues, soil, or water samples. Many nematodes are saprophytic living on dead plant materials, others, such as the alfalfa stem nematode, are parasitic living on live plants. There are other nematodes, including the root-knot, root-lesion, and stylet nematodes, which may damage alfalfa but the extent of their distribution in Utah is not fully known and damage by them is probably slight.

Control of nematodes

Crop rotation has been a major control measure. When plowing out alfalfa it is essential to kill the stand completely. Scattered plants that persist can act as a reservoir of inoculum to infest the alfalfa crop when it is again returned to the land.

Soil fumigation on more valuable land is becoming common for cash crops of high value, but at present it is expensive and therefore cannot be justified for use in controlling nematodes attacking alfalfa.

The best control is by crop rotation and the use of resistant varieties. Lahontan does have resistance to the stem nematode, bacterial wilt, fusarium wilt, and the spotted alfalfa aphid. On the other hand, it is susceptible to leaf diseases which may become serious in wet years, and it is a poor seed producer. It is not as well adapted as the southern type alfalfas to the long growing season in St. George due to a scanty fourth crop. It grows a little too early in the spring for Cache Valley and as a result sustains more damage from late spring frosts than some other varieties. Such frosts do not normally kill the plants.

Efforts are being made to transfer Lahontan's desirable features into a locally developed synthetic. This involves a backcrossing program to transfer stem nematode and spotted aphid resistance from Lahontan to a high seed producing synthetic that carries resistance to bacterial wilt and the common foliage diseases. It is too early in the program to evaluate results; however, before long, more and better adapted varieties with stem nematode resistance should be available. Until then, Lahontan is the best alfalfa to grow on stem-nematode-infested land.

Bul. 414. Biennial report of the Utah Agricultural Experiment Station, 1956-58.

This is a statistical summary listing the research projects, the cooperative agreements with other agencies, the research grants, service activities of the Experiment Station, publications, staff, and financial statement.



Improved tall hybrid snapdragons produce
an excellent cut flower crop in June

For early spring bloom

plant annuals in late summer

OTTO RIETHMANN

ANNUAL flowers that are planted in the fall are in full bloom from four to six weeks earlier than annuals planted in the spring. This has been shown by many overwintering tests conducted over a four-year period at the Farmington Field Station of the Experiment Station. While annuals grow from seed and bloom in the same growing season, spring and early summer are needed for the plants to develop and blooming is delayed to late summer and fall. The earlier blooming of fall plantings has many advantages.

Flower production in annuals is profuse and their display of color intense and long lasting. Front yard

●
OTTO RIETHMANN is research associate in floriculture. The experimental gardens of the Experiment Station are north of Farmington on Highway 89. Visitors are welcome.

gardens and parks miss much of their attraction during the late summer and fall without annuals. In addition, many annuals are used for cut flowers for home decoration and for growing commercially.

These tests at Farmington have shown that certain annuals can be planted successfully in the fall. However, the time of planting is not only important for successful overwintering, it also affects the size and quality of the crop. Some annuals overwinter when planted at any time between the end of July and the beginning of September, whereas with others the date of planting is important. An end of July planting may produce growth 1 to 2 feet high, whereas a September planting may result in growth of one to a few inches. These different stages of development before the winter starts are responsible for successful overwintering, and must be

Annuals normally blooming in July in Utah will bloom in May if planted in the fall



FARM AND HOME SCIENCE

known for each particular kind of flower. For example, Chinese forget-me-not and snapdragon overwinter successfully when planted in early August, but candytuft survives only when planted at the end of August and in early September.

In addition to winter hardiness, size and quality of the crop depend on the time of planting. When planted too early, the crop may be overmature for overwintering and produce a poor quality flower the following spring. When planted too late, the plant will not have time to establish itself before winter and growth will be slow the following spring.

The earliness of blooming is affected only slightly by the time when the seed is planted in the fall. Small plants resulting from a late planting may bloom at about the same time as plants that were planted earlier.

Planting date important for biennials

The planting date is also important in determining the successful overwintering growth and blooming of biennial plants. Some biennials such as campanula (cup and saucer) must be planted not later than the end of July, otherwise they remain in the leaf stage for another year without blooming.

Culture

All flowers planted for overwintering are preferably sown directly out-of-doors. The seed should be planted in rows in shallow furrows with the soil pressed firmly over them. Small seed such as that of snapdragon and foxglove should have only a light covering of soil.

To obtain good germination of the seed during the hot season the soil must be kept continuously moist by watering as often as the surface begins to dry. Where crusting occurs, soil conditioners such as peat moss, compost, vermiculite, or sand may be used for covering.

When the young developing plants are growing too slowly, a light side dressing with a soluble

(Continued on page 79)

Annuals, biennials, and a few perennials recommended for planting in the fall in the home garden or for commercial purposes

Name	Possibility for overwintering	Best time to plant seed	Remarks
Candytuft, Iceberg and other	Good	End of August Beginning of September	Earlier plantings are not successful or have poor quality
Canterbury bells annual	Very good	End of July Middle of August	
Canterbury bells biennial	Very good	Middle to end of July	Later plantings will not bloom the following year
Carnation, large double flowering Chaubauds giant Enfant de Nice Marguerita	Very good	Beginning until middle of August	Produce an excellent crop of good quality
Centaurea bachelor button	Very good	Middle of August until middle of September	Earlier plantings grow too high
Cheiranthus Siberian wall-flowers	Very good	End of July to middle of August	Attractive for borders during May
Chinese asters	Fair to very poor	Beginning to middle of August	Overwintering is not dependable
Chinese forget-me-not Blanch Burpee	Very good	Beginning to end of August	Attractive blue sprays 2½ to 3½ feet high
Delphinium annual and perennial	Good	End of July to middle of August	They produce an excellent crop the following year
English daisies	Very good	End of July to middle of August	
Feverfew	Very good	Beginning to middle of August	
Foxglove	Fair to good	End of July to middle of August	
Gloriosa daisy	Very good	End of July until end of August	Attractive for a large flower border beginning to bloom by end of June
Larkspur	Very good	End of July and August	
Lupine-Russell hybrid	Good	End of July to middle of August	Bloom during June
Pansy	Very good	End of July to middle of August	
Poppy, Iceland	Very good	Beginning to middle of August	
Scabiosa—annual Giant Imperial hybrid and others	Very good	End of July until middle of August	Produces excellent cut flowers beginning by end of June — the lower varieties are good for borders
Snapdragon	Good	End of July until middle of August	Improved tall hybrids produce an excellent cut flower crop in June
Sweet sultans and Centaurea americana	Good	Beginning to middle of August	
Sweet Williams	Very good	Beginning to middle of August	

WATER REQUIREMENTS FOR BEEF CATTLE

WATER is one of the most important nutrients for animals, but like oxygen, it is generally taken for granted. Its importance is emphasized when we realize that the tissues of an animal's body may lose nearly all their fat and almost one-half of their protein and still maintain life, but a loss of 10 percent of their water results in death.

There is relatively little information available on specific requirements of animals for water and on the results of water restriction. With this need for more information in mind, some preliminary investigations with beef steers were begun at the Utah Agricultural Experiment Station early in 1959.

Twelve two-year-old Hereford steers were individually fed chopped alfalfa hay and water for two weeks to obtain background data to be used with their body weights in assigning them to experimental treatments. The steers were divided into four groups of three each, and with-

each day during the 26 days of the water restriction and the 24 day recovery period (figure 1). The animals were confined to a common pen during the night. Periodic animal weights were taken in the morning after the animals had been off feed and water for 15 hours.

The temperatures in the barn during the restriction period averaged 30° Fahrenheit minimum and 40° maximum. These temperatures increased to 34° and 45°, respectively, during the recovery period. The water temperature ranged from 40° to 42° Fahrenheit.

The results of the experiment in terms of water consumed, feed consumed, and body weight changes are given in figures 1 to 3. This information is preliminary and inconclusive, but it suggests interesting questions.

Adequate amounts of water

(1) Approximately eight gallons of water per day is adequate to

and Morris, USDA research men, summarized much of the published data on water consumption of cattle. This summary indicates: that water requirements are 0.3 to 0.4 gallons per pound of dry matter consumed; salted rations may increase water consumption 20 to 100 percent; and that environmental temperature will increase the gallons of water consumed per pound of dry matter from 0.37 at 40° Fahrenheit to 0.88 at 90°.

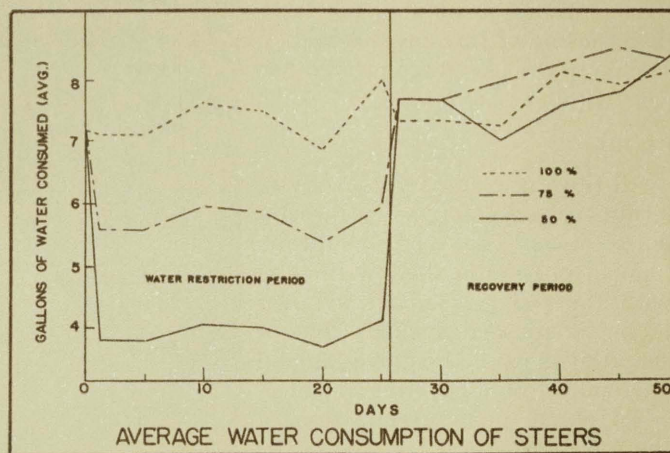
It is also necessary to consider how much water is supplied by the forage and by the metabolism of the nutrients in the body. Animals with silage or green forage in their diets do not require as much drinking water as they do when they are on dry feed. The chemical processes of digestion and absorption give off water as a by-product. Such "metabolic" water is of sufficient quantity to meet the needs of hibernating animals and contributes to the total water requirements of all animals.

(2) Twenty-two pounds of good

JOHN E. BUTCHER
LORIN E. HARRIS
ROBERT J. RALEIGH

DR. JOHN E. BUTCHER is associate professor, **DR. LORIN E. HARRIS** is professor, and **DR. ROBERT J. RALEIGH**, research associate of animal husbandry. These men all work in the area of animal nutrition.

Water restriction and its effects on feed intake and body weight



in each group of three, one animal was given all the water he wanted to drink, the next animal received 75 percent of the water intake of the first animal, and the third animal received 50 percent of the water intake of the first.

These animals were tied in stalls and individually fed and watered

satisfy 920 pound steers under the conditions of this experiment. Other research has shown, however, that an increase in body weight, a high protein or salt content of the diet, an increase in total dry matter consumed, or a rise in environmental temperature will increase the animal's desire for water. Winchester

quality chopped alfalfa hay per day will maintain 920 pound steers in average to good condition and provide one and a quarter pounds average daily gain.

Effects of water restriction

(3) Water restriction apparently results in reductions of feed con-

sumed and of body weights. However, restricting water by 25 percent appears only to reduce the intestinal fill of water, whereas animals with the 50 percent reduced water intake showed a reduction of body weight, even after regaining an intestinal fill of water. These results indicate that a moderate restriction of water over a relatively short period of time may not be harmful, but as the time or amount is increased the body weights are reduced when compared to animals on unrestricted water. These data are not considered adequate as a basis for recommending any restriction of drinking water to cattle.

Influence of intestinal fill on body weight

(4) The initial days of the recovery period provide a striking illustration of the influence of intestinal fill of water on body weights of steers.

Questions suggested

- (5) This experiment brings up several questions, among them:
- Should such an experiment be

the feed is not as readily available as it was in this experiment?

To answer these questions, further research is necessary. Are the problems concerning water for livestock important enough and is there enough interest among livestock men to justify more research on the needs of animals for water?

ZINC DEFICIENCY

(Continued from page 65)

After the severe symptoms of the nutritional deficiency have been controlled, applications of 10 pounds of zinc sulfate per 100 gallons of spray each year prevents any loss either in yield or fruit quality.

Symptoms of zinc deficiency

"Little leaf," "rosette," and "die back" are appropriate symptoms for zinc deficiency in horticultural plants and are among the symptoms of the disease. This nutritional disease has been noted in Utah orchards for a number of years. At present the problem is confined to horticultural crops, particularly

ed areas apple, plum, pear, and pecan have been severely damaged by little leaf and die back.

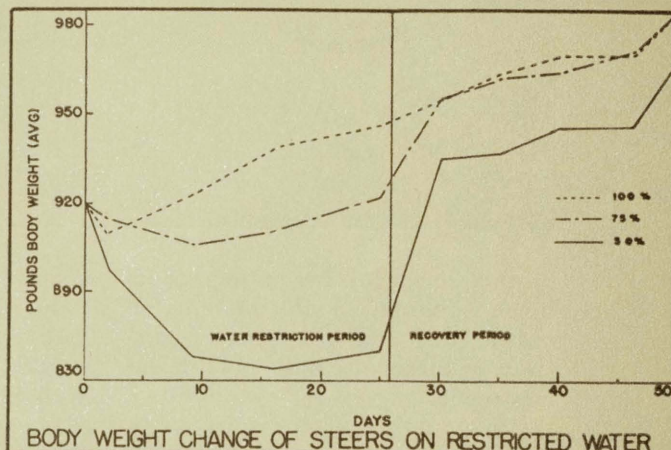
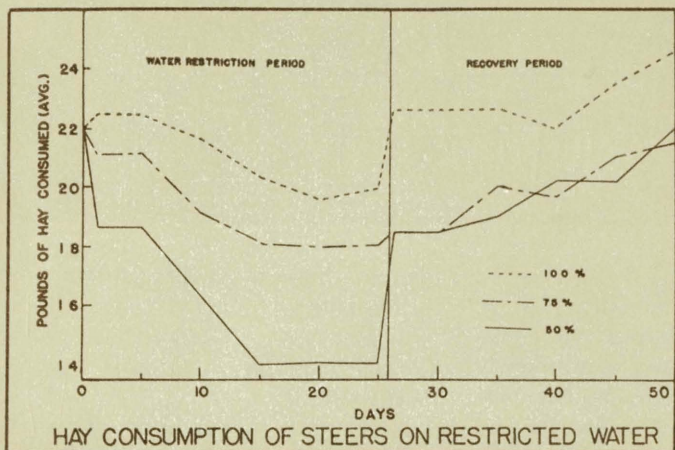
Flat and pointed peaches are common on trees showing zinc deficiency symptoms. Such misshapen fruit also occurs on trees showing only traces of zinc deficiency in the foliage. It is possible that these abnormal fruit shapes may be useful symptoms in detecting early stages of zinc deficiency for prevention and control.

Soil treatments

Zinc salts react vigorously with clay and organic matter. For this reason the addition of zinc to the soil around trees suffering from the deficiency usually is without effect. Control depends on the direct application of zinc to the tree, usually as a dormant spray.



After spending a year in research in tomato breeding for the Agricultural Research Administration, Dr. Wade Dewey has returned to University employment and research in wheat breeding. He now has a new dry land winter wheat with superior bread making qualities ready for increase.



carried over a longer period of time?

b. Did the group of steers with 25 percent water restriction actually use their feed more efficiently? They did make similar gains on less feed than did the steers on full water during the time on test.

c. Would the results of this work apply to pasture or range, where

fruit crops, although in surrounding states it is becoming acute on many row crops.

When the disease is acute, trees are misshapen or they die. There is considerable loss in quantity and quality of fruit. Sweet cherries, peaches, and apricots are most widely affected although in limit-

Dr. Roice H. Anderson, professor of agricultural economics, is spending the year at Stanford University on a research grant. He will work in agricultural economics and marketing. While he is away, Dr. E. Boyd Wennergren will take his place. Dr. Wennergren recently completed the work for his PhD degree at Cornell University. He is a graduate of Utah State University. He will spend full time in research.

CAN THE SCHOOL LUNCH BECOME AN OUTLET FOR

R. H. ANDERSON

TURKEY

CAN the school lunch program become an important outlet for turkey? One school district in Utah served turkey 27 times during the school year 1957-58 and served an average of more than 4 pounds of turkey per student taking lunch. Can the use of turkey be expanded

with use in 1957-58 when turkey was purchased by schools in the open market.

Benchmarks of potential use

Benchmarks of potential turkey use were established by asking school lunch supervisors how fre-

from lunch supervisors the frequency of serving turkey, a measure of frequency was calculated from the amount of turkey purchased on the basis of five servings per pound. For some lunches less than this amount of turkey was served over high protein noodles or in other



to this level in the entire school lunch program of the state? To answer this and other questions a study of turkey use in school lunches was made.

Information on turkey use in the past two school years was obtained from school lunch supervisors of 36 of the 39 Utah school districts. Inclusion of these two years gave a comparison of turkey use in 1956-57 when government-purchased turkey was available free to the schools

quently turkey could be served to children without their tiring of it. Two sets of conditions were assumed. (1) Turkey continuously available through government purchase at no cost to the district and (2) turkey readily available at 1957-58 prices.

Actual and potential turkey use compared

It is standard practice among districts to allow 5 servings per pound of meat such as turkey where bone is included and 8 servings per pound for those items which have no waste. Since it was impossible to obtain

combinations to meet protein requirements.

Turkey available at no cost to district

An average of 1.67 pounds of turkey per student was used in Utah school districts during the school year 1956-57 when turkey was available through government purchase (table 1). At five servings per pound this would provide turkey about once a month. Seven or about 20 percent of the districts purchased small quantities of turkey in addition to that obtained from the government. The tendency, however, was

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DR. ROICE H. ANDERSON is professor of agricultural economics. His main interest is the marketing of poultry and poultry products.

for the use of turkey to be limited to that supplied by the government. About four pounds per person was the potential use based on opinions of the supervisors. About 40 percent of the supervisors indicated turkey could be served four times a month and one-third indicated it could be served twice a month (figure 1). The other supervisors were about equally divided in their opinions between once and three times a month.

Turkey available at 1957-58 prices

During 1957-58 when turkey was purchased by the school districts,

pervisors of two districts thought that turkey could be served only twice a year (figure 1). Nearly 40 percent believed turkey could be served once a month and 15 percent twice a month. Nearly 20 percent thought turkey could be served three times a month and a similar percentage indicated four times a month.

Are these benchmarks of turkey use realistic?

Seven of the school districts served as much turkey in 1957-58, when turkey was purchased, as the supervisors in those districts thought

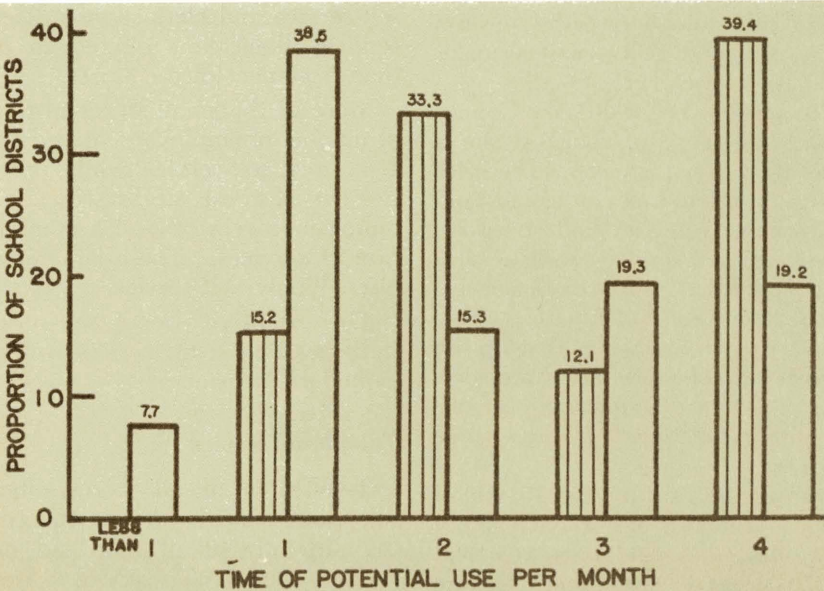


Fig. 1. Potential use of turkey by Utah school districts when available at no cost from government (1956-57) (stripped bars) and when purchased by the districts at 1957-58 prices (plain bars)

it was served an average of six times per year and provided 1.2 pounds per person. This compared with a potential of 3.0 pounds per person based on supervisors' opinions (table 1). At 1957-58 prices for turkey, su-

could be served. Only three districts used turkey at levels higher than the average potential of three pounds per person. Potential levels of use of three or four times per month were suggested by about half of the supervi-

Table 1. Amount of turkey served per student per year—actual and potential

Year	Amount per student	
	Actual	Potential
Available at no cost 1956-57	pounds 1.67	pounds 4.00
Purchased 1957-58	pounds 1.20	pounds 3.00

What can be concluded from this study?

1. Most school lunch supervisors are agreed that turkey can be served one to four times per month.
2. Practically as much turkey was purchased by school districts for use in school lunches as was used when supplied by the government at no cost.
3. Cost of roast turkey per serving is among the highest-cost meat dishes served in school lunches. Prepared in other ways, turkey, particularly of lower grades, can compete favorably with other alternatives and provide variety.
4. Based on opinions of school lunch supervisors, it seems feasible to more than double the use of turkey in the school lunch program in Utah at prices which prevailed in 1957-58. To accomplish this the following is recommended:
 - (a) Encourage distributors to have turkey continuously available and make this fact known to school lunch supervisors in areas in which they operate.
 - (b) Encourage distributors to provide facilities for getting turkey to the various schools at the time and in the form and quality desired.
 - (c) Provide information to school lunch people such as recipes and methods of preparing turkey. To be most effective actual demonstrations of turkey preparation for quantity feeding would be desirable.

sors if turkey were available from the government and by almost 40 percent if available at 1957-58 prices.

Why was not more turkey used?

If less turkey were used than the potential indicated at 1957-58 prices, supervisors were asked to give reasons why. Of 22 replies eight or 36 percent indicated that turkey was not readily available, five gave lack of facilities as the reason, and three said turkey required too much work to prepare. Two said that children tired of turkey.

Time in preparation and cost per serving

Although only two lunch supervisors indicated time in preparation as a deterrent to use of turkey, this and cost per serving were no doubt important factors in establishing the potential level.

Seventy-five percent of the turkey served in Utah school districts in 1957-58 was about equally divided (Continued on page 80)

Salt Lake Grocery Stores Offer Many Customer Services

LEORA S. GALLOWAY AND ETHELWYN B. WILCOX

THE type of service offered by a retail grocery store often influences the customer's decision as to where to shop for groceries. Since a large proportion of the consumer's money is spent for food, she wants the best quality for her money. However, she is also interested in the services offered. Does the store have self-service or clerk-service? Does it offer telephone ordering service, credit, and delivery service, or is it cash and carry?

The customer in Salt Lake County has a wide range of choice if she is selecting a retail grocery store with services rendered as one of her considerations. She can find stores offering only self-service or self-service in combination with clerk-service; stores that take telephone orders, and extend credit; stores that do not provide any of these last three services; or stores having one or different combinations of these three services.

During the fall of 1956 151 retail grocery stores in Salt Lake County were selected at random from a total of 320 stores in the county. These

stores were surveyed to determine the services made available to customers.

Self-service vs. clerk-service

Three-fourths of the chain stores offered only self-service (table 1) while three-fourths of the independent stores used a combination of self-service and clerk-service. Clerk-service, alone, was offered in less than 5 percent of the stores.

More of the small stores in terms of number of employees offered both clerk and self-service while only 8 percent of those stores with 15 or more employees offered a combination of services. These large stores offered only self-service.

The extensive use of self-service indicates that it at least is well accepted by consumers.

Telephone service

Two-thirds of all stores offered telephone service for use in ordering although about half had only limited telephone service. Stores were classified as using limited service if they provided service for only some customers, or for only those customers who purchased a certain amount of goods, or if an extra charge was made for the service. If none of these restrictions was placed on this service, the stores were classified as giving full service.

MRS. LEORA S. GALLOWAY has recently resigned as research associate in foods and nutrition. Dr. Wilcox is professor of foods and nutrition and in charge of the research in that area. The study reported here is part of a Western Regional Research project WM-26 and was financed in part under the Research and Marketing Act of 1946.

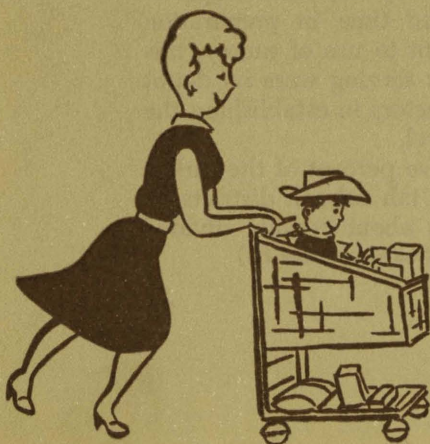


Table 1. Stores with self and/or clerk service classified by various characteristics

	Stores	Self-service only	Clerk-service only	Both services
	number	percent	percent	percent
All stores	151	26	3	71
Location				
Rural stores	20	30	0	70
Urban stores	131	26	3	71
Shopping area				
Downtown	21	43	5	52
Neighborhood	113	23	3	74
Isolated	17	29	0	71
Ownership				
Chain stores	19	74	0	26
Independent stores	132	20	3	77
Unaffiliated	78	24	5	70
Affiliated*	54	13	0	87
Number of employees				
Stores with 1 or 2	62	16	5	79
Stores with 3 to 6	54	18	0	82
Stores with 7 to 14	23	39	4	56
Stores with 15 or more	12	92	0	8

*Voluntary chain as IGA or AG stores

Full or limited telephone service was made available to customers of two-thirds of the independent stores. More of the downtown and isolated stores provided telephone service than did neighborhood stores. Two-thirds of the stores employing 3-6 persons offered telephone service. More stores of this size offered the service than smaller or larger stores classified by number of employees.

Delivery service

Delivery service was not offered as frequently as telephone service. Approximately half of the stores offered delivery service; however, in half of these stores it was on a limited basis. Isolated and downtown shopping area stores (two-thirds) provided more delivery service than did the stores in the other

areas. One-half of the neighborhood stores and only one-tenth of the chain stores offered delivery service. Most of the large retail grocery stores did not deliver. In the two groups of stores, neighborhood and independent, where delivery service was most frequently offered, about half of them did not restrict its use.

Credit service

Credit was available in more stores than was either telephone or delivery service; 67 percent offered this service, although credit in 57 percent of these stores was on a limited basis. Limited credit was classified as providing credit for some but not all customers, or for those who purchased a certain amount of goods, or if the store made an extra charge for the service. Stores were classified

as offering full credit to customers if there was none of these restrictions.

One-half of the downtown stores provided credit to their customers as compared to more than two-thirds of the neighborhood or isolated area stores which extended credit. Almost four times as many independent stores offered credit as did chain stores. As the number of persons employed by the store increased, the percentage of stores offering credit to their customers decreased (figure 1).

These findings indicate that customers who like to use credit service do most of their shopping in neighborhood or independently owned stores.

In only 17 percent of the stores surveyed were none of the services (telephone, delivery, or credit) provided (figure 1). All three services were offered by approximately one-half of the independent stores as compared to one-tenth of the chain stores.

NEW PUBLICATION

Bul. 415. Marketing Utah lambs at alternative markets, by N. K. Roberts and N. E. Wright. Department of Agricultural Economics.

This bulletin discusses the cost factors in marketing lambs and makes a comparison of market costs and price differentials among markets. The study of price variations at selected markets indicated that the price spread between markets did not always represent the cost of moving lambs between these markets. At certain periods some markets had a definite price advantage over others. Thus by knowing the costs of marketing lambs at alternative markets, a producer can decide better at which market he will obtain the greatest return from his lambs.

Fig. 1. Percent of stores making credit available to customers in terms of equivalent full-time employees.

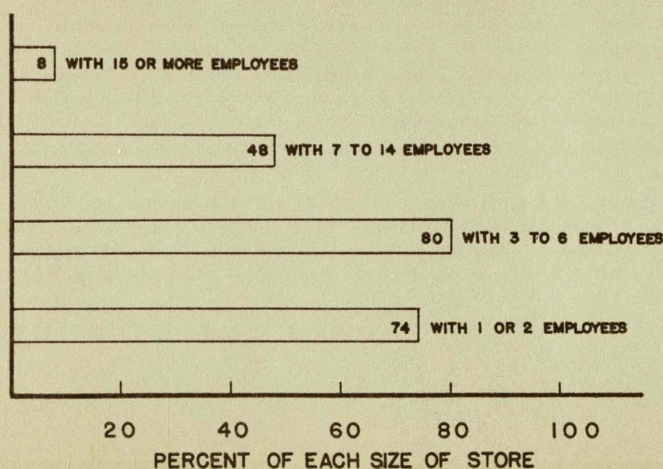
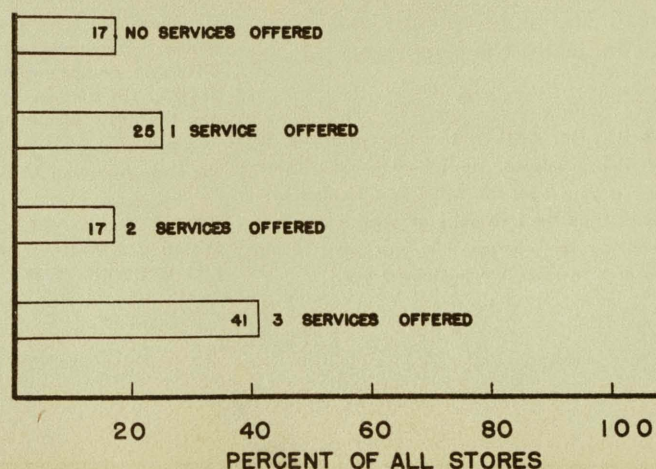
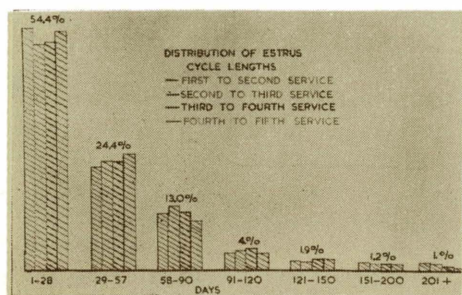


Fig. 2. Percent of all stores offering combination of telephone, delivery, or credit service.

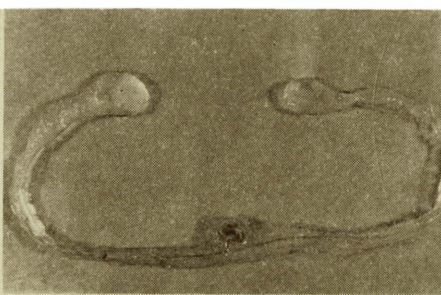


Infertility in Dairy Cows an Economic Problem

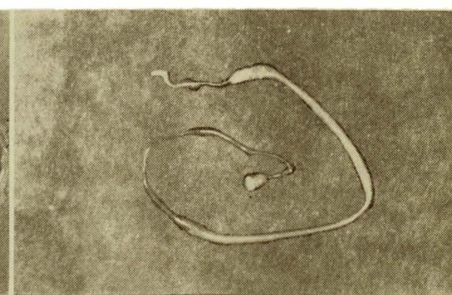
JAY W. CALL
WERNER LEIDL



Estrus cycle lengths



Normal developing embryo



Degenerating embryo

THE failure of dairy cows to produce a calf each year is estimated to cost the dairymen of Utah about six million dollars a year and the nation three hundred million. It has also been estimated that 20 percent of cows require three or more services per conception. These cows are considered problem cows. Another 6 or 7 percent are non-breeders and are sold for slaughter.

During the past year a study has been made on the causes of infertility in dairy cattle. Breeding records from the Cache Valley Breeding Association were used to find the cows that were poor breeders.

Among the causes of infertility were the following:

(1) Irregular time between heat periods. Only 20 percent of the problem cows returned to heat on the twentieth or twenty-first day. Ten percent came before the twentieth day and 70 percent after the twenty-first day. Because of the variation in the heat cycle, many cows come in heat and are not observed and consequently not bred. This indicates the importance of ob-

serving cows daily for evidence of heat. Eight percent of the repeat breeder cows go 90 days or more before coming back in heat (figure 1). This delayed heat period is expensive to the dairyman. Rectal examination for pregnancy just prior to 90 days would determine whether the cow has conceived.

(2) Physical examination of problem cows showed 32 percent were pregnant, 18 percent were normal, 34 percent had infection or some disorder of the reproductive tract, not including the ovary. The ovary accounted for 15 percent of the trouble, mostly because of ovarian cysts.

Vibriosis, trichomoniasis, leptospirosis, and brucellosis were not diagnosed in these cows. But early treatment of an infected reproductive tract is important in decreasing the number of infertile cows.

(3) Forty-two percent of the problem cows were bred within 60 days after calving. This is too soon. Over half of the problem cows had two calves or less; this suggests that added attention should be given to young heifers. Previous calving and proper care during calving seem to be important in avoiding infertility. Fourteen percent of the non-breeders had had trouble during calving.

(4) Another cause of failure to produce a calf is embryonic death. Most of the deaths occur up to the 33rd or 35th day after fertilization. The embryos that die degenerate and are reabsorbed by the cow. One is unable to detect any visible trouble except that the cow comes back in heat. Embryonic death is estimated to account for 16 percent of the infertility problems in dairy cattle.

NEW PUBLICATION SERIES

An important function of the Utah Agricultural Experiment Station is to conduct research on problems of primary interest to the people of Utah. Some of these studies may be confined to a single community or county. Often the studies are concerned with problems of limited interest to people outside Utah.

There has been a continuing problem as to how the results of such studies should be reported. Frequently mimeographed material is discarded. After considerable thought and discussion on the problem we have decided to initiate a new series called UTAH RESOURCES SERIES. The purpose of the series is to bring together publications pertaining to Utah problems and the development and management of Utah resources.

Distribution of these publications will be restricted primarily to interested persons within the state including libraries.

Numbers 1 and 2 of the new series are already published. No. 1 is entitled ECONOMIC CROP ALTERNATIVES FOR DRY FARM AREAS OF NORTHERN UTAH, by Earnest M. Morrison and Russell V. Withers of the Department of Agricultural Economics. No. 2 is GRIT SUPPLEMENTS FOR GROWING TURKEYS, by Dr. C. I. Draper, head of the Department of Poultry Husbandry.

DR. JAY W. CALL is assistant professor of veterinary science. He joined the staff just over a year ago. DR. LEIDL is a visiting professor from the University of Munich who has been on the campus the past year doing research in infertility in dairy cattle.

Fluoride tests terminated

The extensive study of the effects of fluorides on dairy cows has been concluded with the slaughter of the 32 animals purchased for the test in 1951. Tissues taken from these animals at necropsy will be carefully weighed, measured, and examined macroscopically and microscopically. Detailed histopathological, chemical, and enzymatic investigations are still to be made on selected tissues of each carcass. When these tests are completed, all the findings will be correlated and evaluated and the results published.

Because of the great interest in air pollution and its effect on crops and livestock in the industrial areas of Utah, and because information on the toxicity of fluorides released into the atmosphere was limited, the Experiment Station began a controlled study to determine the effects on domestic animals. The 32 heifers purchased for the study were divided into groups and fed varying amounts of fluoride in their feed. One group received no fluoride, one 25 ppm (parts per million), another 50 ppm, and another received 100 ppm.

Special facilities were constructed to house these animals. These comprise a covered manger, hard surfaced yards, an open shed with a dirt floor, and a feed storage shed. The yard and shed are divided by fence panels and gates into 8 units of equal size. The units were designed so that each animal could be tied up for individual feeding.

The study has been evaluated from time to time during the eight years it has been underway by biopsies where parts of the ribs of the animals have been removed, by blood analysis, and by dental classification.

At the end of four years it was concluded that the levels of fluorides fed did not alter significantly the feed intake, gain in liveweight, height at withers, reproduction, or milk and butterfat production during the first lactation. However, dental fluorosis of varying degree was observed in animal fed 25 ppm of fluorine or more since calves. Extoses (extra bone growths) were found in certain bones of cows fed diets containing 100 ppm of fluorine and intermittent lameness occurred in some animals of this group.

Examination of bone removed at biopsies and blood analysis reveal that definite physio-pathologic changes have taken place in animals on elevated levels of fluorine. Animals receiving sodium fluoride and hay contaminated with fluoride stored approximately three times as much fluorine in their bones as did the animals receiving calcium fluoride and approximately seven to eight times as much fluoride as the control group of animals.

Studies have included kidney and liver function tests and an investigation of the metabolism of normal food nutrients in the animals. Studies of the possible effects

of fluorides on enzyme systems have also been made.

A large number of scientists and departments have been involved in these studies. Dr. George E. Stoddard and George Q. Bateman of the Department of Dairy Industry have had charge of the management of the animals. Dr. L. E. Harris of the Department of Animal Husbandry has supervised the nutritional studies. Dr. D. A. Greenwood, professor of biochemistry, has been in charge of the chemical analyses and has given general supervision to the project. Dr. LeGrande Shupe, professor of veterinary science, has made the pathologic studies. In addition, many other staff members and graduate assistants have been involved in the study over the eight year period.

In addition to the major experiment with the 32 dairy cows now being concluded, a companion study was made with 9 cows to see if they responded differently when reared in an area receiving fluoride pollutants from industry. In still another experiment 16 heifer calves were used to determine if different types of fluorine pollutants would exert different effects on the animals.

Other studies on the effects of fluorides on plants and animals have been made by the Experiment Station. Members of the Department of Botany and Plant Pathology are studying the effects of fluorides on enzymes present in plant and animal tissue. Dr. Greenwood is studying the effects of atmospheric fluorides on man. Dr. W. H. Sigler of the Department of Wild Life Management is investigating the level of fluorides toxic or lethal to fish and fish eggs.

The fluoride studies have been financed in part by the Columbia-Geneva Division of United States Steel and by grants from the National Institutes of Health.

The development of reliable information relating to the concentrations of atmospheric fluorides and the time required to injure plants and the levels and time required for contaminated forage to affect animals is important. Early results of these studies have been used to establish definite standards which are now being used by farmers and representatives of industry to settle their claims. The final results should contribute to a better understanding between industry and agriculture.

OVERWINTERING FLOWERS

(Continued from page 71)

nitrogen fertilizer such as ammonium nitrate or ammonium sulfate may be applied. The application should be repeated the following spring after new growth starts.

Fall planting of many annuals will give the home gardener great satisfaction. The fine quality of early flowers in the following year well pays for the effort involved.

Effective flower borders are fall planted Cheiranthus (Siberian wallflowers), Chinese forget-me-nots, Gloriosa daisy, low varieties of Scabiosa, Russell hybrid lupines, snapdragons, delphiniums, sweet williams, carnations, and canterbury bells. Excellent for early cut flowers are double flowering carnation, candytuft, Imperial hybrid Scabiosa, tall hybrid snapdragons, Pacific hybrid delphinium, and Russell hybrid lupine.

FRUIT DRINKS

(Continued from page 64)

caryl, and M.C.P. artificial sweetener were tried and all were found satisfactory. Of course, the honey gave a background taste of its own. The success of the trial of artificial sweeteners gives promise that the drink could be used by diabetic sufferers.

DESERT LAND ACT

(Continued from page 62)

Nearly all of the entrymen who were permitted to go ahead with development soon installed pump wells. The high percentage of applicants doing this was partly a result of public policy. Usually applications for land entries are not permitted in Utah unless there is good evidence that the applicant is ready to drill a well. The special land use permit was instigated in Utah for this purpose.

Applicants tended to develop the land in segments. Few operators completed all clearing and leveling during the first year. Apparently, applicants with "allowed" entries realized that development is justified in most instances only on the basis of continued irrigated crop production. Acquiring patent under the Desert Land Act is an expensive way of obtaining ownership for grazing purposes unless there are other considerations.



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Utah State University
Division of Agricultural Sciences
Agricultural Experiment Station
Logan, Utah

Wynne Thorne
Director

Form U. Q. Permit 1142

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CONTRIBUTIONS TO RESEARCH

May 1 to August 15, 1959

Columbia-Geneva Division U.S. Steel Company	\$88,872 for studies of the effects of fluorine on plants and animals \$3000 for fertilizer studies
Herman Frasch Foundation	\$10,765 for studies on the relation of nitrogen and water in soils
Utah Power and Light Company	\$8470 for rural electrification studies
Telluride Power Company	\$545 for rural electrification studies
Bakelite Company	\$5000 for canal lining studies
Utah Turkey Federation	\$5000 for study of staphylococcus in turkeys
Indian Jute Company	\$2500 for canal lining studies
Cache Valley Breeders Association	\$2245 for research on embryonic death of cattle
Moroni Feed Company	\$1900 for the study of poultry nutrition
National Turkey Federation	\$1875 for studies of staphylococcus in turkeys
Abbott Laboratories	\$1000 for studies of staphylococcus in turkeys
California Spray Chemical Corporation	\$1000 for studies of mites and insects on fruit trees
Shell Chemical Company	\$1000 for insecticide studies. Dieldrin, al- drin, chlordane, and phosdrin
Stauffer Chemical Company	\$500 for insecticide studies
Utah Cannery Association	\$500 for studies on the culture of to- matoes and lima beans
Western Condensing Company	\$500 for study of the use of whey in making ice cream
Chemagro Corporation	20 pounds Ethyl guthion wettable
Colloidal Products Corporation	12 pints X77 and 12 pounds KT-7
Geigy Agricultural Chemicals	14 pounds Diazinon wettable and 12 pounds chlorobenzilate wettable
General Chemicals Division	10 pounds Genite 923 wettable and 20 pounds Kepone wettable
Naugatuck Chemical Division	20 pounds Aramite wettable
Niagara Chemical Division	24 pounds Thiodan wettable and 74 pounds Tedion
Rohm and Haas Company	Kelthane
Union Carbide Chemicals Company	100 pounds Sevin wettable

TURKEY IN THE SCHOOL LUNCH

(Continued from page 75)

between grade B and grade C turkeys and cost the districts an average of 31 cents per pound for C grade birds and 32 cents for B grade ones. The other 25 percent of the turkeys were grade A and cost an average of 40 cents per pound. Assuming grade A turkey was used as roast turkey the estimated cost would be 8 cents per serving. If the lower grades of turkey were used as creamed turkey, the cost would be 6½ cents per serving.

Lunch supervisors were asked the cost per serving of their highest- and lowest-cost meat or meat-substitute dish. Based on 22 replies the highest-cost meat dish averaged 8.6 cents per serving and varied from 6 to 15 cents among the districts. This is about the same level of cost as for roast turkey which would indicate that roast turkey was among the high cost meat dishes served in school lunches. The lowest-cost meat or meat substitute dish averaged 4.1 cents per serving and varied from 2 to 9 cents among districts. These dishes included such meat substitutes as macaroni and cheese, baked beans, and eggs as well as various casserole dishes with some meat or fish used as flavor. Creamed turkey had an average cost per serving about midway between the lowest-cost and the highest-cost meat or meat substitute dishes.

Bul. 411. Community problems and group participation, by Theral R. Black and Jerrilyn Black. Department of Sociology. 23 p.

The report considers three questions: (1) What are some of the important economic, civic, and educational problems in rural Utah which can be solved by group effort. (2) How much do rural people participate in such groups. (3) How can these facts be explained.

The study brings attention to a need for persons to involve themselves more fully in the economic, civic, and educational well-being of their communities. It also suggests that leaders become more aware of the need for increased human productiveness through effective organizations.